

# **Unconsolidated Aquifer Systems of Delaware County, Indiana**

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Eleven unconsolidated aquifer systems have been mapped in Delaware County: the Till Veneer; the New Castle Till; the Bluffton Till; the New Castle Subsystem; the Bluffton Till Subsystem; the New Castle Complex; the Bluffton Complex; the Buried Valley; the White River and Tributaries Outwash; the White River and Tributaries Outwash Subsystem and the Wabash River and Tributaries Outwash Subsystem. Boundaries of these aquifer systems are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Pre-Wisconsin and Wisconsin glacial sediments completely cover Delaware County. However, the thickness of unconsolidated sediments is quite variable. Depth to the bedrock surface of central Delaware County is shallow and, in general, deepens to the north and south. Thickness of sediments that overlie bedrock range from 0 feet, where bedrock is exposed near the White River in east-central Delaware County, to as much as 330 feet where glacial sediments have filled pre-glacial valleys.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays.

## **Till Veneer Aquifer System**

The Till Veneer Aquifer System has the most limited ground-water resources of the unconsolidated aquifer systems in the county. The system is generally mapped in areas where the bedrock surface is shallow and the overlying unconsolidated deposits are commonly less than 50 feet.

There is little potential for ground water production in the Till Veneer Aquifer System in Delaware County. Clay materials dominate the unconsolidated deposits but in some isolated areas thin, fine grained sand and gravel units are present. Most wells in the mapped area are completed in the underlying bedrock and there are no reported wells that produce from the Till Veneer Aquifer System. However, large diameter bucket wells may be successful in meeting the needs of some domestic users.

Because of the generally low permeability of the near-surface materials, this system is not very susceptible to contamination from surface sources. However, there are areas where bedrock is extremely shallow. These areas are moderately susceptible to contamination.

### **New Castle Till Aquifer System / Bluffton Till Aquifer System**

In Delaware County the New Castle Till Aquifer System and Bluffton Till Aquifer System are mapped as one system because the aquifer characteristics are similar. The systems typically consist of thick clay with intermittent sands and gravels that in places are up to 250 feet in total thickness.

The New Castle Till Aquifer System and Bluffton Till Aquifer System are capable of meeting the needs of domestic and some high-capacity users. Well depths generally range from 45 to 95 feet below surface. Potential aquifer materials include sands and/or gravels that typically range from 5 to 25 feet thick and are overlain by 30 to 75 feet of clay with intermittent sands. Domestic well capacities are typically 10 to 50 gallons per minute (gpm). There are four registered significant ground-water withdrawal facilities (5 wells) that report well capacities ranging from 75 to 800 gpm. However, it is not expected that the upper range of high-capacity yields are typical throughout Delaware County. Static water levels are commonly 10 to 30 feet below surface with some reports of flowing wells.

These aquifer systems are generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits.

### **New Castle Till Aquifer Subsystem / Bluffton Till Aquifer Subsystem**

The New Castle Till Aquifer Subsystem and Bluffton Till Aquifer Subsystem are mapped mostly in the northern portion of Delaware County. The subsystem(s) are mapped similar to that of the New Castle Till and Bluffton Till Aquifer Systems. However, potential aquifer materials are thinner and potential yield is less in the subsystem(s).

Although approximately 85 percent of wells in the area utilize the underlying bedrock aquifer system, the subsystems are capable of meeting the needs of some domestic users. However, in some cases it is necessary for drillers to continue below the aquifer bearing zone into underlying clay deposits. This increases well capacity by allowing for extra borehole storage. Typical well depths range from 30 feet to 70 feet. Potential aquifer materials include thin, intratill sand and gravel deposits that are generally 4 to 12 feet thick and are capped by till 25 to 55 feet thick. Typical well yields range from 5 to 35 gpm. Static water levels are generally 10 to 25 feet below land surface.

The subsystems are generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits.

## **New Castle Complex Aquifer System / Bluffton Complex Aquifer System**

The New Castle Complex Aquifer System and Bluffton Complex Aquifer System are mapped in portions of northwestern and southern Delaware County. These systems include unconsolidated deposits that are quite variable in materials and thickness. The systems are mapped as one system because they have similar aquifer characteristics. Sand and gravel aquifer deposits vary from thin to massive and are typically overlain by a thick till. However, in some areas the system also exhibits multiple layers of outwash and till above the primary aquifer resource. Total thickness of unconsolidated deposits is as much as 200 feet in places.

Typical well depths range from 45 to 90 feet. Aquifer materials range from 1 to 100 feet in thickness but are typically 5 to 35 feet thick. These aquifer deposits are commonly overlain by till with intermittent sands and gravels that are generally 30 to 75 feet thick. The multiple intermittent sands and gravels are typically 5 to 15 feet thick.

The systems are capable of meeting the needs of domestic and some high-capacity users. Typical domestic yields range from 10 to 50 gpm. Static water levels commonly range from 10 to 25 feet below surface. Five registered significant ground-water withdrawal facilities (10 wells) report pumping capacities that range from 100 gpm to 800 gpm.

These aquifer systems are not very susceptible to contamination where thick clay materials overlie aquifer materials. However, in some areas where outwash is present at or near the surface and clay deposits are thin, the system is at moderate risk.

## **Buried Valley Aquifer System**

In Delaware County the Buried Valley Aquifer System consists of glacial materials deposited in pre-glacial bedrock valleys. The system is mapped primarily in two areas of the south-central portion of Delaware County. Although there are additional buried bedrock valleys in Delaware County, only the larger buried valleys that contain water-bearing sediments at depth have been included as mapped units of the Buried Valley Aquifer System.

Unconsolidated deposits overlying bedrock in the Buried Valley Aquifer System are nearly 330 feet thick in places. Typical deposits include glacial till with multiple intermittent sands and gravels. Aquifer materials include sand and gravel deposits that are typically 5 to 20 feet thick. Although most wells completed in this system utilize sediments at shallower depths, deeper sand and gravel deposits are available. Some wells produce at depths greater than 185 feet. In general, deposits that overlie the deeper aquifer resource include clay materials with intermittent sand and gravels that combined range from 45 to 150 feet thick.

Wells are commonly 55 to 155 feet deep. This aquifer system has the potential to meet the needs of domestic and some high-capacity users. Domestic well yields are typically 10 to 60 gpm. Static water levels range from 10 to 40 feet below surface. There are three registered high-capacity facilities (4 wells) with reported yields ranging from 100 to 600 gpm. The Buried

Valley Aquifer System is generally not very susceptible to surface contamination. Thick till deposits overlie the aquifer units and inhibit the downward migration of contaminants.

### **White River and Tributaries Outwash Aquifer System**

In Delaware County the White River and Tributaries Outwash Aquifer System is mapped along a part of the White River from the western county line to Yorktown. This system contains outwash valley train and alluvial deposits that filled portions of the White River Valley. Total thickness of unconsolidated deposits are as much as 135 feet with up to 110 feet of continuous sand and gravel in places. In some areas, however, clay deposits, generally less than 15 feet thick, disrupt the continuity of the sands and gravels. Well depths are typically 40 to 75 feet. Aquifer materials are commonly 15 to 40 feet thick and are capped by 10 to 20 feet of clay or silt.

The system has the potential to meet the needs of domestic and high-capacity users. Domestic well yields commonly range from 10 to 35 gpm. Static water levels range from 10 to 25 feet below surface with some reports of flowing wells. Although there are no registered significant water withdrawal facilities using this system in Delaware County, several high-capacity facilities in nearby Madison County utilize the outwash system.

In areas that lack overlying clays, this aquifer system is highly susceptible to contamination from surface sources. Where the aquifer system is overlain by clay or silt deposits, the aquifer is moderately susceptible to surface contamination.

### **White River and Tributaries Outwash Aquifer Subsystem / Wabash River and Tributaries Outwash Aquifer Subsystem**

The White River and Tributaries Outwash Aquifer Subsystem is mapped along part of the White River floodplain and a small part of Killbuck Creek. The Wabash River and Tributaries Outwash Aquifer Subsystem is mapped along the floodplain of the Mississinewa River. In general, the subsystems are mapped where the topographic position is higher and thickness of saturated outwash deposits is considerably less than the main outwash system. Also, aquifer units are generally overlain by greater thicknesses of fine-grained materials. In the central part of the county the White River and Tributaries Outwash Aquifer Subsystem broadens to include areas where bedrock is shallow but thick outwash sediments, capped by clay, are likely in connection with White River alluvial and outwash sediments.

There are few wells completed in these subsystems. Most wells in the mapped area bypass the unconsolidated sediments and continue to bedrock allowing for extra borehole storage. However, penetration of some bedrock wells is less than a few feet and it is likely that the overlying sands and gravels contribute to the overall well yield. Well depths typically range from 35 to 80 feet below surface. Sand and gravel aquifer deposits range from 2 to 60 feet thick but are generally 10 to 30 feet thick. The sand and gravel deposits in some areas are separated by

intermittent clay or sandy clay materials that disrupt the continuity of the sands and gravels. Aquifer materials are commonly capped by silt, sandy clay, or clay ranging from 5 to 40 feet thick.

These aquifer systems have the potential to meet the needs of domestic and some high-capacity users. Domestic well yields are typically from 5 to 25 gpm and static water levels are 10 to 20 feet below surface. There are no registered significant water withdrawal facilities in the outwash subsystems in Delaware County. However, one public well reportedly pumped 90 gpm.

Areas within these aquifer systems that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

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